

The role of E-box-, G-box- and RY-motif-binding proteins in regulation of ethylene response in *Arabidopsis thaliana*

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Plant hormone ethylene is a major regulator of growth and development that plays an important role in various processes such as seed germination, response to biotic and abiotic stresses, senescence etc. Ethylene signaling proceeds via a linear pathway that activates EIN3 and EIL1 transcription factors (TF) – the key regulators of ethylene response. Besides EIN3 binding to gene promoters, co-factors are often required to trigger gene expression upon ethylene treatment. In this work, we perform a genome-wide analysis of EIN3 binding to investigate complex mechanisms of EIN3-mediated gene expression upon ethylene treatment. *De novo* motif search in EIN3 ChIP-seq peaks (publicly available data) with Homer tool found a variety of enriched motifs. Besides EBS-like motif (well-known EIN3-binding site) ($p < 1e-109$), E-box-like motif ($p < 1e-125$), G-box-like motif ($p < 1e-47$), and RY-like motif ($p < 1e-52$) were in the top. Intriguingly, E-box-like motif rather than EBS-like motif was the first ranked. Using Tomtom tool, E-box-, G-box- and RY-like motifs were annotated as the binding sites for bZIP family group I TFs, PIF family TFs and FUS3 binding sites, correspondingly. Enrichment of the motifs annotated as the binding sites of EIN3-unrelated TFs supports indirectly a possible role of these TFs as EIN3 co-factors. To further investigate this possibility, we performed an analysis of EIN3 and bZIP29/PIF4/FUS3 binding co-occurrence in gene promoters and found it statistically significant ($p < 2.2e-16$). It is noteworthy that FUS3, PIF family and bZIP family group I TFs are known to take part in several ethylene-regulated processes. Therefore, according to our results we suggest that FUS3, PIF family and bZIP family group I TFs could influence EIN3 functioning to regulate gene expression on the genome-wide level. These TFs are promising candidates for future investigations of EIN3 functional partners.